Press release

Multifunctional coatings to prevent premature failures on wind turbine generators

- *IK4-TEKNIKER is developing a new generation of surface solutions preventing fatigue-related failures in multipliers and gearboxes installed on wind turbine generators*
- *A 40% increase in durability will be achieved for gearbox bearings*

(Eibar, Basque Country. 28 February, 2019).- Multipliers and gearboxes fitted on wind turbine generators (WTG) have to withstand critical operating conditions that sometimes produce cracks in bearings which are commonly known as WEC (*White Etching Cracks*).

It has been estimated that premature failures in bearings associated with WEC appear after 5-10% of their operating life has elapsed. Likewise, the cost of this failure is not only associated with replacing a specific bearing, but also with shutting down wind turbine generators, meaning that hours of electricity production are lost and that it sometimes becomes necessary replace a complete multiplier installed aboard a WTG nacelle.

Nowadays, technical solutions for bearings to prevent premature failures are based on treatments that have already demonstrated their efficacy in other tribological systems subjected to critical loading and tribocorrosion or conditions such as surface passivation protecting steel against corrosion or the use of (ultra) clean steel and increased surface hardness by nitriding.

Although the solutions developed until now have given rise to substantial improvements in the case of bearings subjected to critical operating conditions, there is nowadays no surface treatment capable of fully overcoming premature failures in bearings caused by WEC that meets all requirements in terms of effectiveness and cost, the two main pillars on which the implementation of a commercial solution is based.

An innovative project

In order to advance towards a solution that can overcome this problematic issue, IK4-TEKNIKER is developing, within the framework of the European project TRIBOSS, in cooperation with the Spanish firms FERSA and Flubetech, the Fraunhofer IPT technology centre and a German company called HOLOEYE Photonics AG, an innovative surface solution for bearings that will make it possible to reduce the failure-defect proportion below 0.01%, with a 40% increase in terms of bearing durability.

On the one hand, the strategy that has been followed consists in combining high performance technologies that are totally **scalable at an industrial level**, such as **laser surface texturising** and **PVD technology** (Physical Vapour Deposition). And, on the other, advanced designs have been developed to improve bearing geometry and contact surfaces that have been combined with thermal chemical surface treatments to prevent the formation and spreading of cracks whilst bearing lubrication is improved.

In this manner, the WEC issue is being addressed from a totally revolutionary perspective that encompasses innovation with regard to bearing geometry, microstructure of the base materials and contact surface when in use.

The challenge for IK4-TEKNIKER in terms of multifunctional surfaces

IK4-TEKNIKER, an organisation with a high degree of specialisation in **surface engineering**, is working, within the framework of the programme itself, on the development of an advanced **surface coating** to prevent premature bearing failures on WTG multipliers and gearboxes.

Specifically, work at the technology centre is focused on combining **HiPIMS technology** (High Impulse Power Magnetron Sputtering) and **DCMS** (Direct Current Magnetron Sputtering) to obtain tribological coatings meeting requirements related to fatigue resistance and low friction.

On the other hand and thanks to its extensive knowledge with regard to **multi-functional surfaces**, IK4-TEKNIKER is carrying out the **basic characterisation of materials and coatings**, as well as **tribologial characterisation at a laboratory scale**, a step that comes before optimising the surface solution adopted to be subsequently validated on test benches.

This solution has a totally innovative and multifunctional character as it will make it possible to minimise the diffusion of hydrogen in the bearing and simultaneously improve the system's tribological behaviour.

The involvement of leading Spanish companies in the production of bearings and development of functional coatings will ensure **industrial scaling** for the solution developed by IK4-TEKNIKER as well as compliance with cost requirements stipulated by FERSA.

Concerning IK4-TEKNIKER

With more than 35 years of experience in applied technology research that has been be transferred to companies, IK4-TEKNIKER has achieved a high degree of specialisation in four major areas (Advanced Manufacturing, Surface Engineering, Product Engineering and ICTs). This means that its cutting edge know-how has been made available to customers to meet their requirements.

Further information

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